

A satellite image of the Western United States and parts of Canada and Mexico. The landscape is dominated by brown and tan colors, indicating dry land and vegetation. Numerous red and orange fire locations are marked with small squares and outlines, primarily concentrated in the western mountain ranges and along the coast. Large, thick white and grey smoke plumes rise from these fires and drift across the Pacific Ocean towards the coast of California and the island of Hawaii. The ocean is a deep blue, and the sky above the fires is filled with smoke.

The role of people in modern U.S. fire regimes

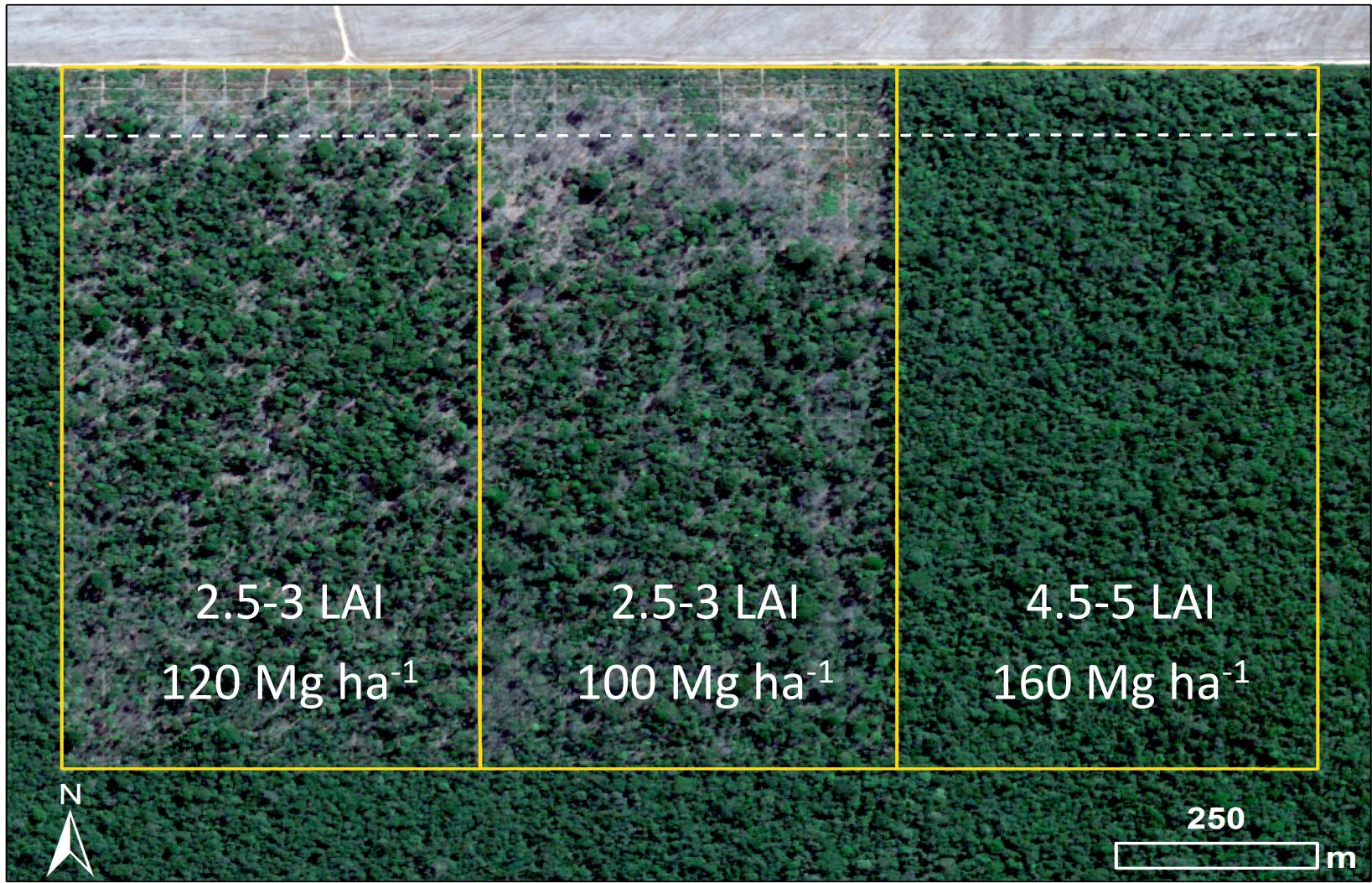
Dr. Jennifer K. Balch

Department of Geography



University of Colorado **Boulder**

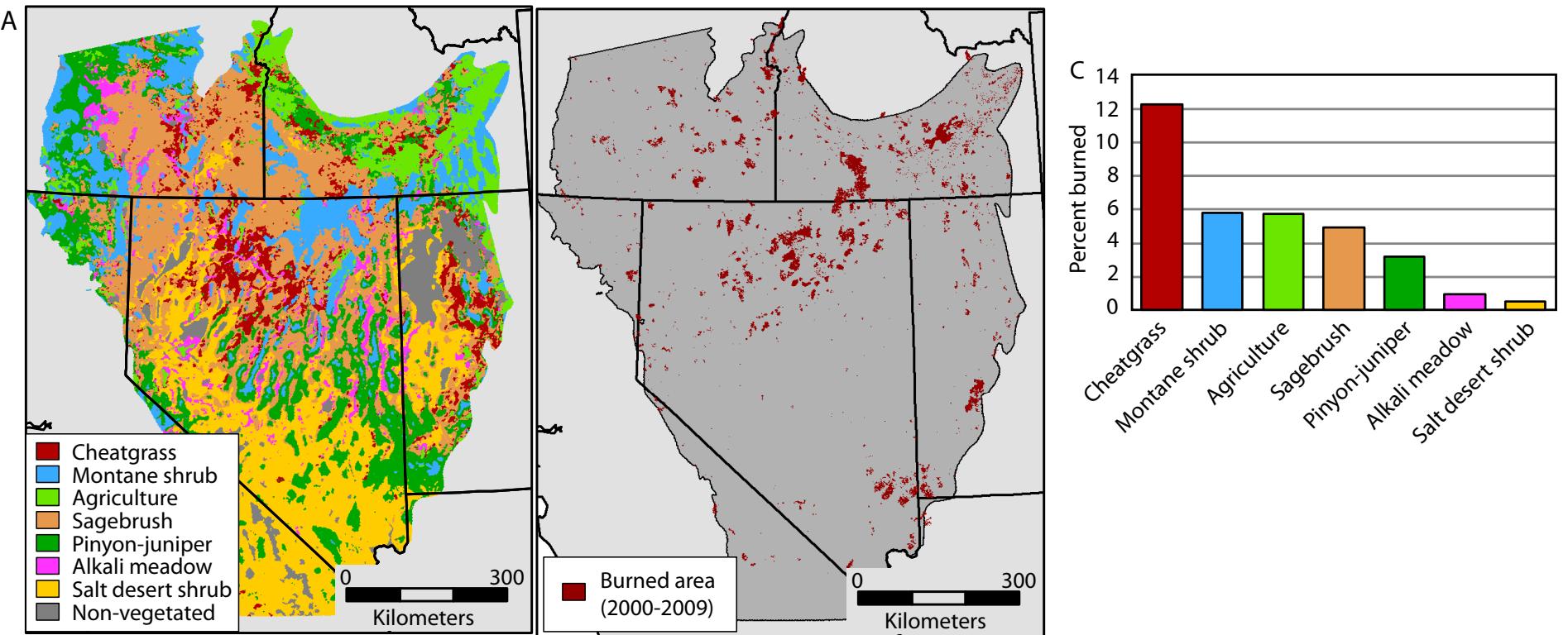
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Balch et al. 2015 Bioscience



Grass-fire cycle in the U.S. Great Basin



Human-started wildfires expand the fire niche across the United States

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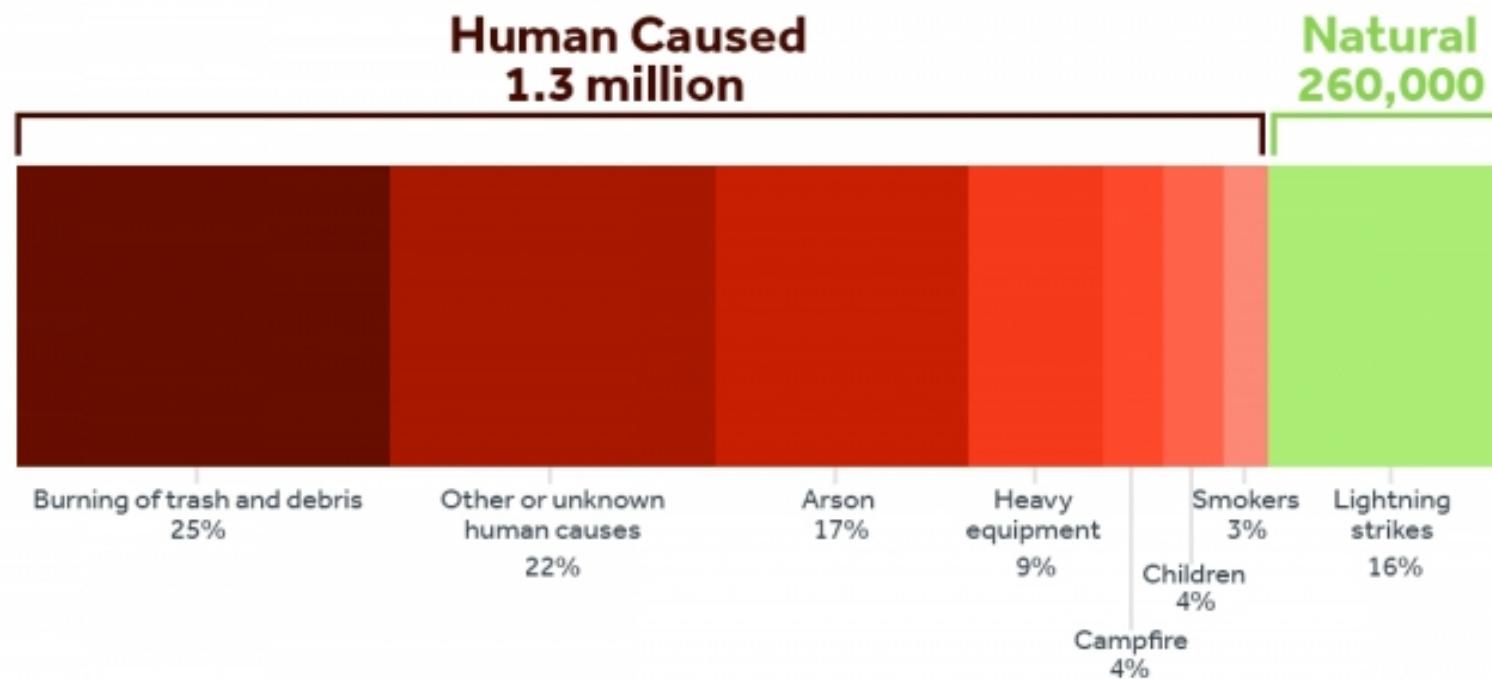
Edited by Gregory P. Asner, Carnegie Institution for Science, Stanford, CA, and approved January 6, 2017 (received for review October 20, 2016)

People:

- started 84% of all wildfires,
- tripled the length of the fire season,
- dominated an area seven times greater than that affected by lightning fires, and
- were responsible for nearly half of all area burned.

Humans Cause Most American Wildfires

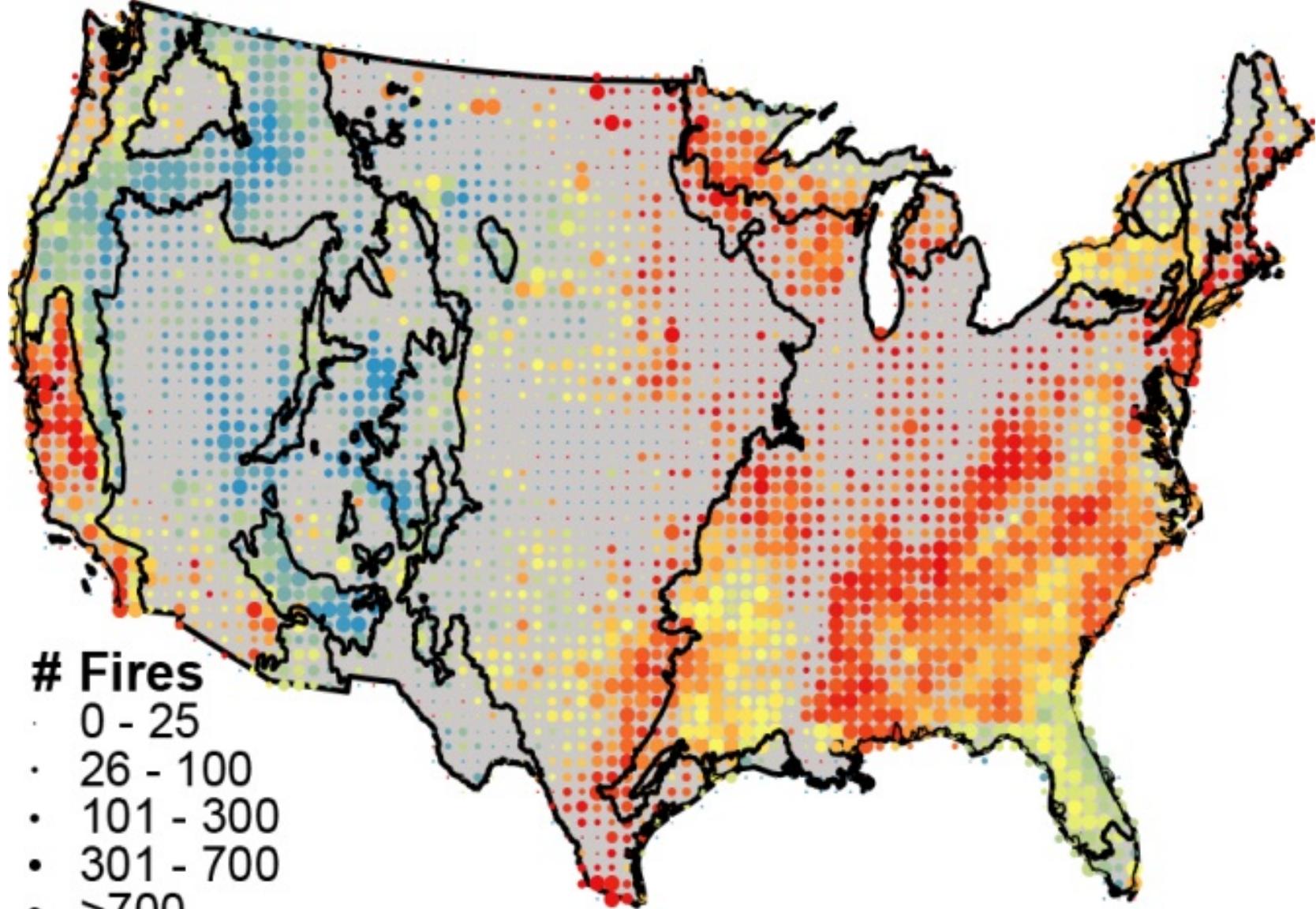
Major Causes of Wildfires in Lower 48 From 1992-2013



Source: Balch et al., 2017, Human-started wildfires expand the fire niche across the United States, PNAS (note that this table includes 2013 data, which was not included in PNAS paper)

CLIMATE CENTRAL

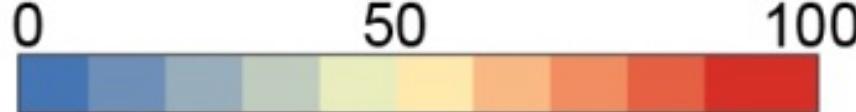
Balch et al. 2017 PNAS



Fires

- 0 - 25
- 26 - 100
- 101 - 300
- 301 - 700
- >700

% Human Ignitions



Balch et al. 2017 PNAS

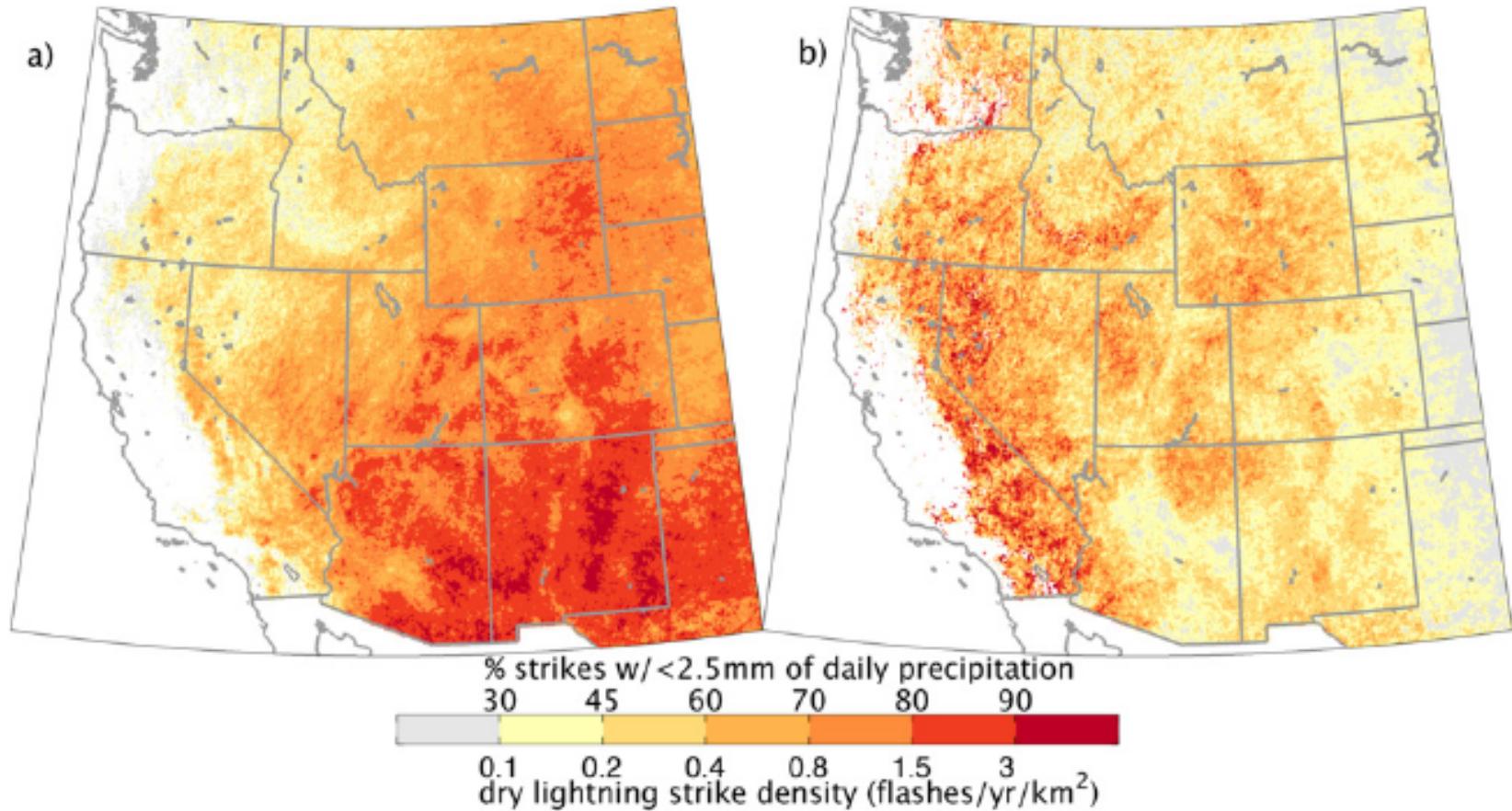
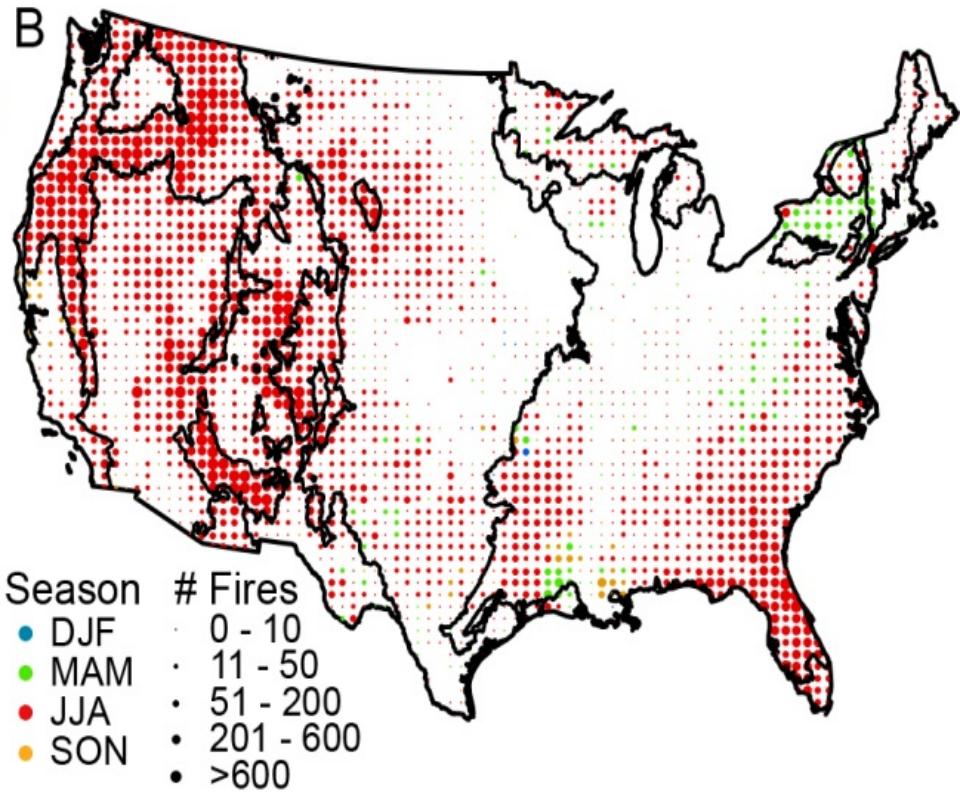
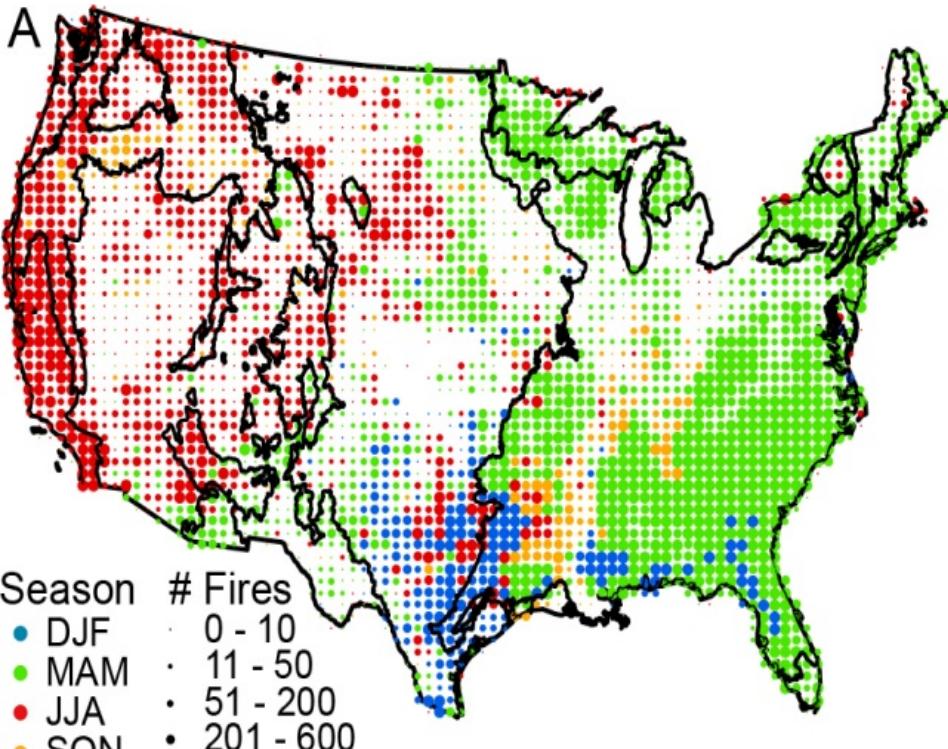
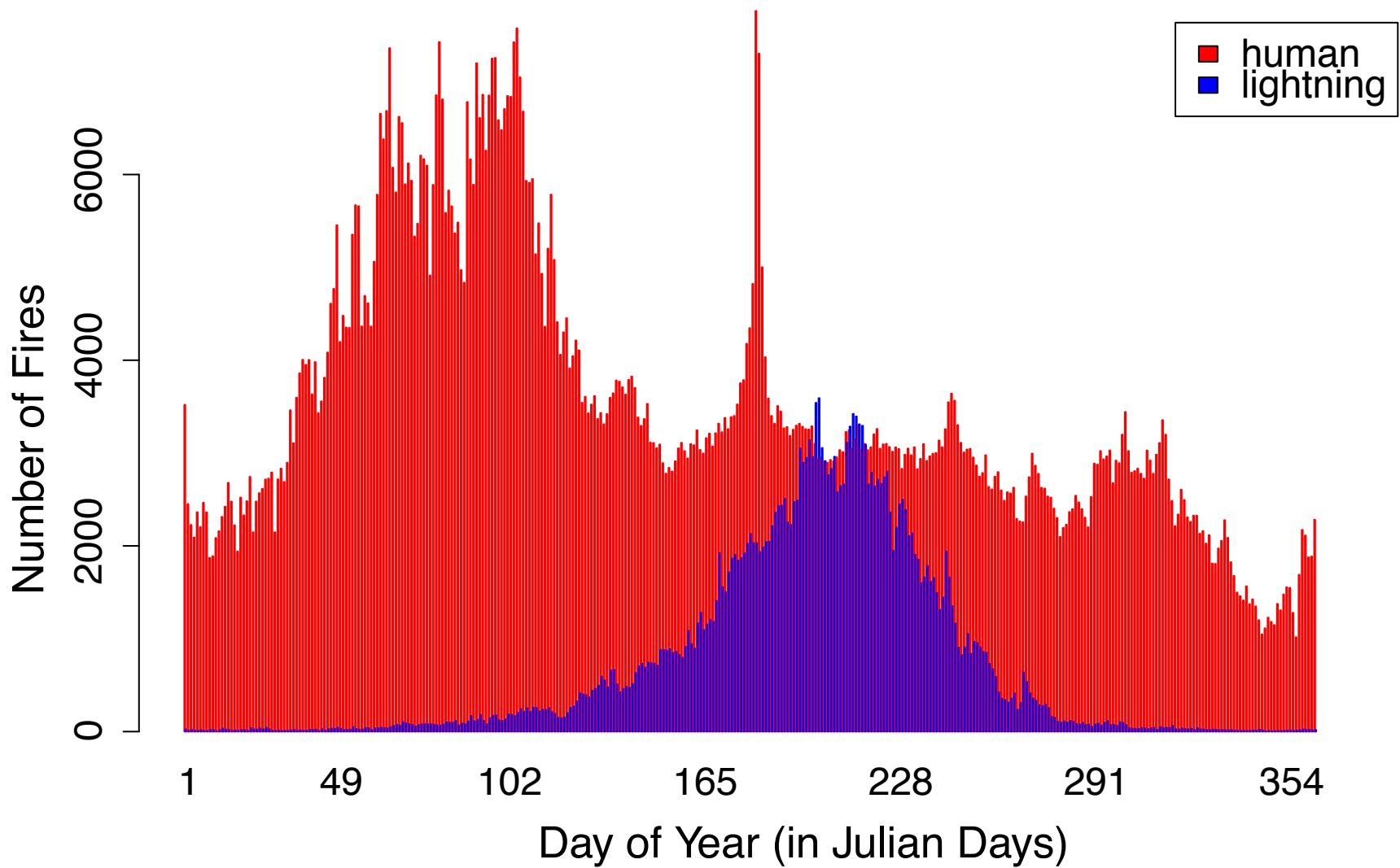
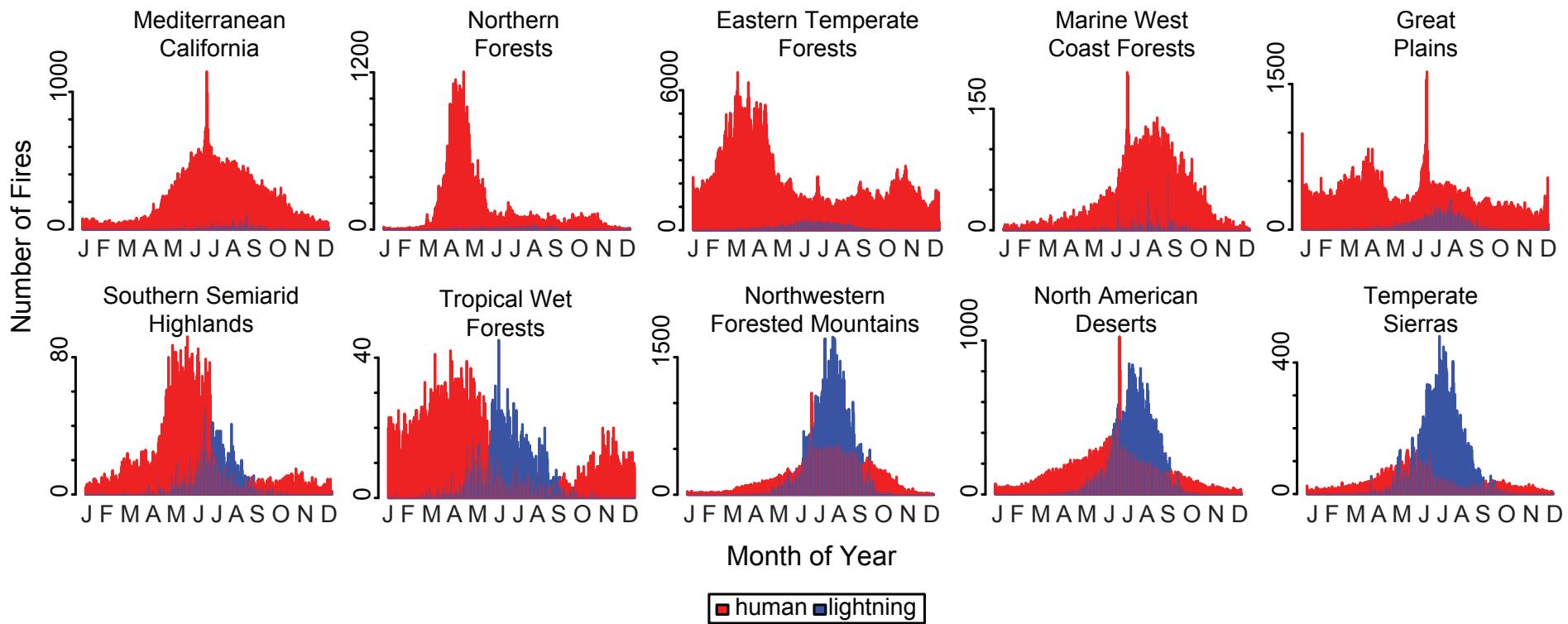


Figure 4. Density of dry lightning (a) and percent of total lightning strikes occurring as dry lightning (b) averaged over May–Oct 1992–2013 aggregated to a 1/24th degree grid. Pixels with fewer than 0.1 combined wet and dry strikes per year per km^2 are masked out.





Balch et al. 2017 PNAS



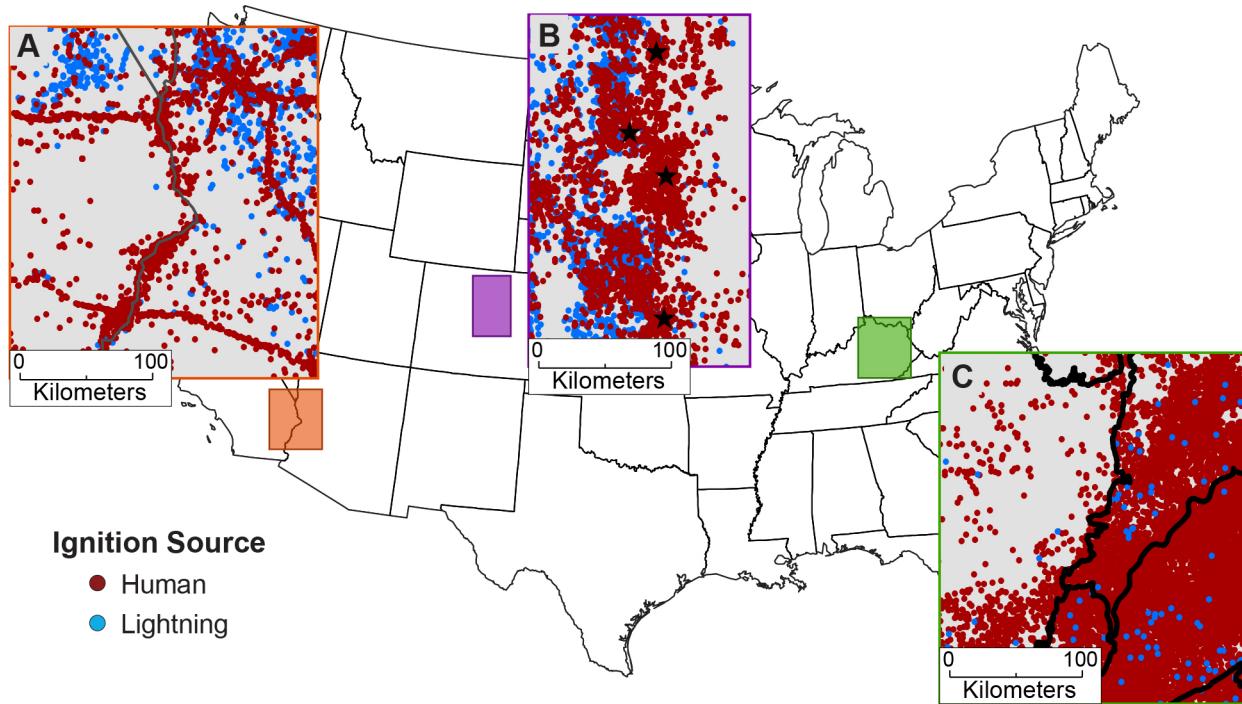
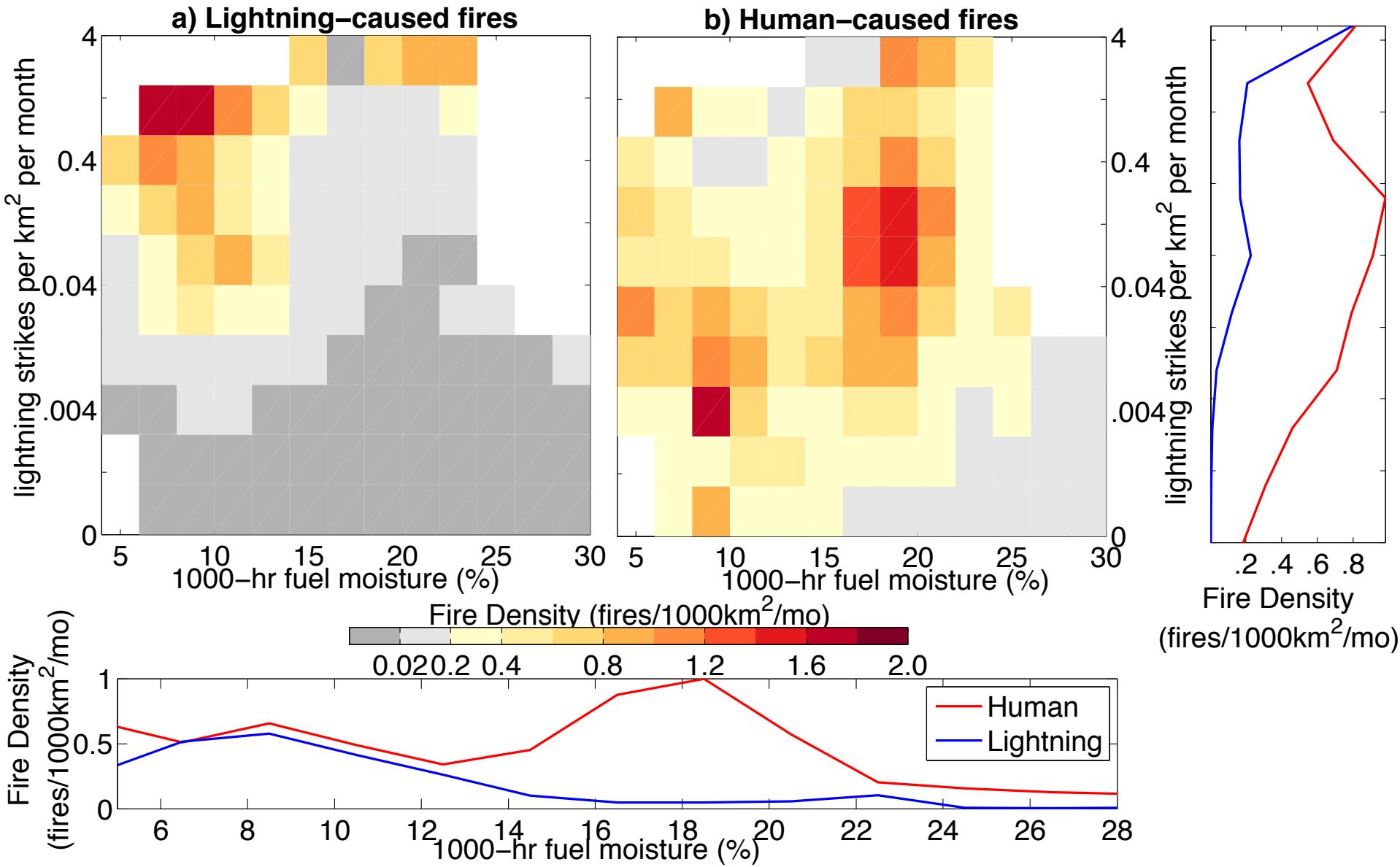
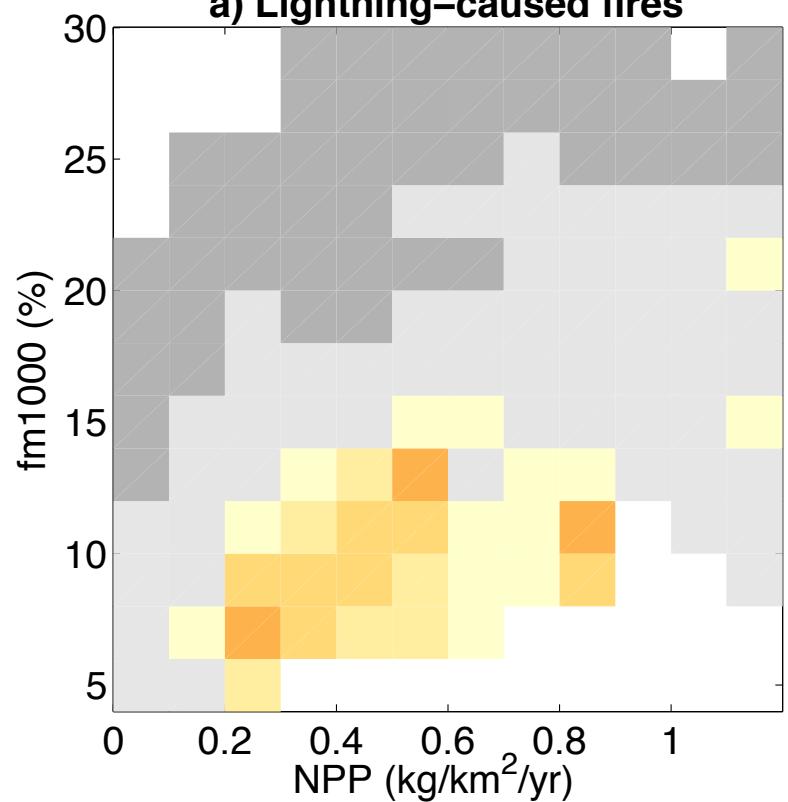


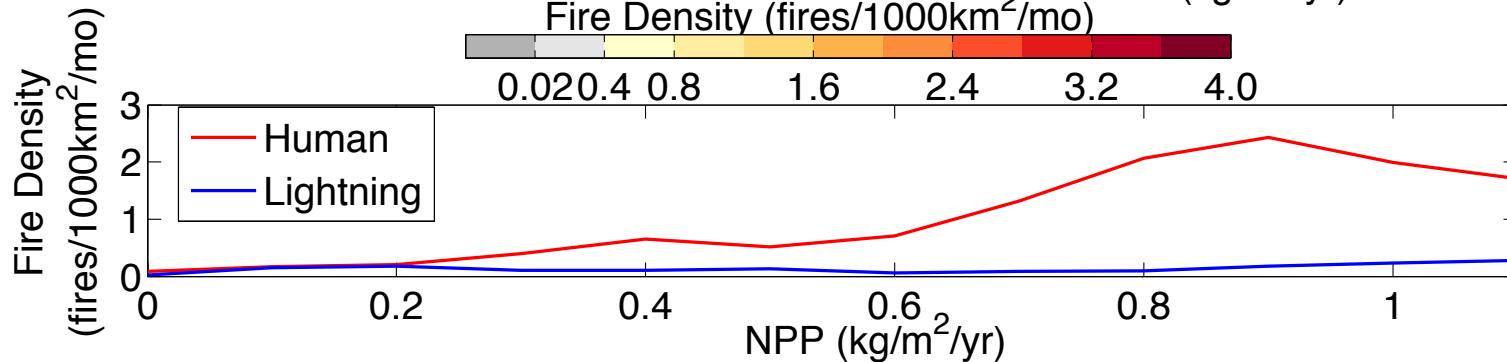
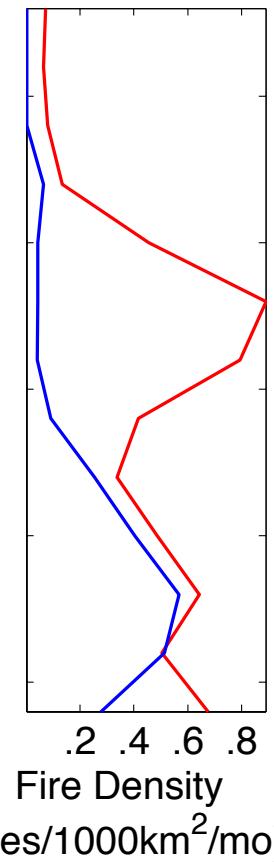
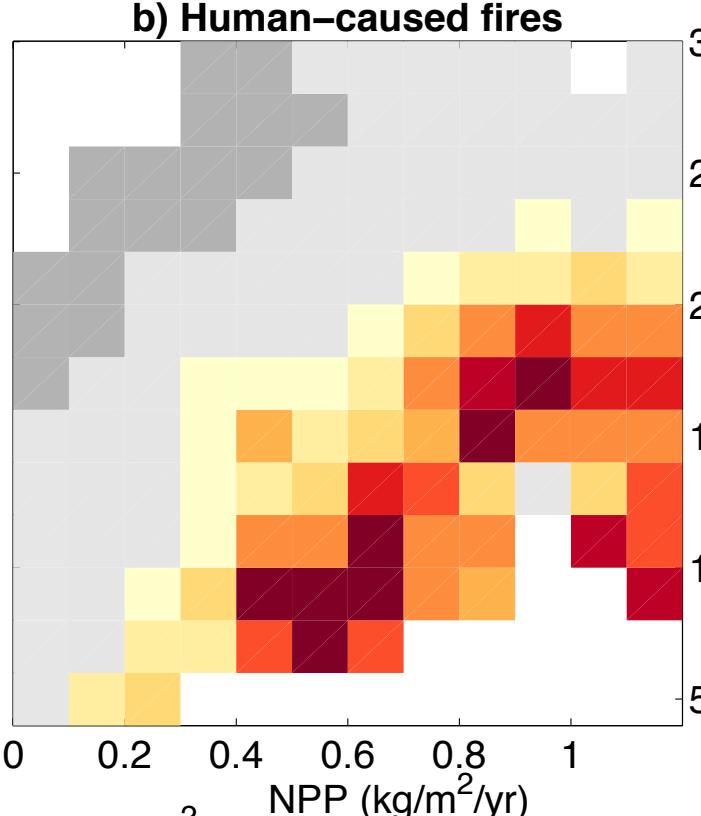
Figure 2. Spatial patterns of human ignitions (red dots) vary across the U.S. A) In the southwest, human ignitions clearly demarcate major highways and agricultural areas along the Colorado River. B) Development along the Front Range in Colorado is a source of many fires at the wildland-urban interface. Stars indicate (from north) the cities of Fort Collins, Boulder, Denver, and Colorado Springs. C) Human fires highlight the ecoregion transition to forested Appalachians, where debris burning dominates the fire signal. Black lines are ecological region level III boundaries.



a) Lightning-caused fires

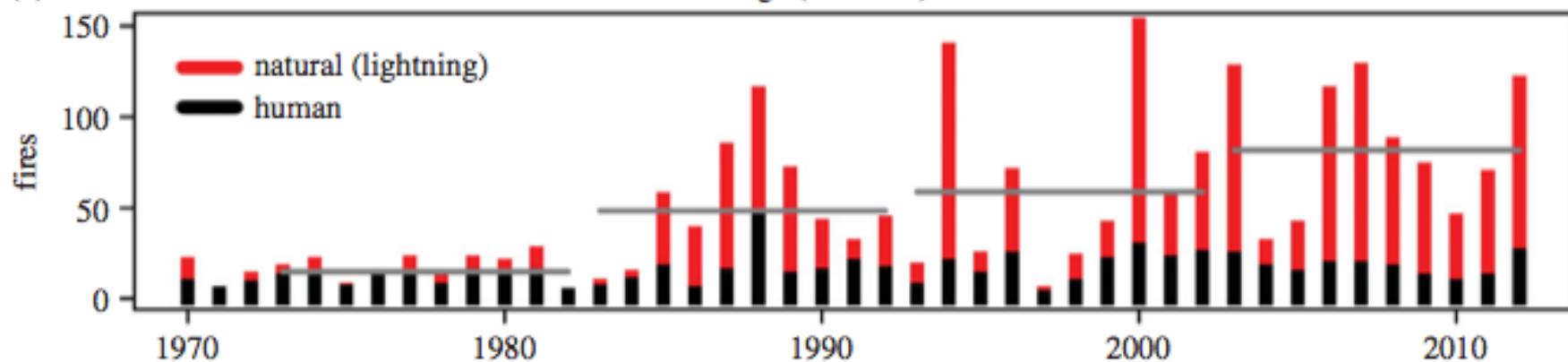


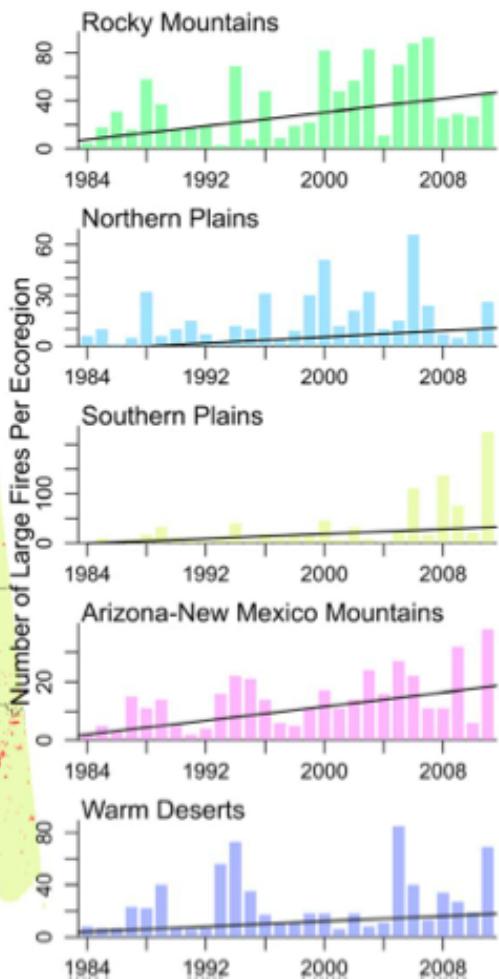
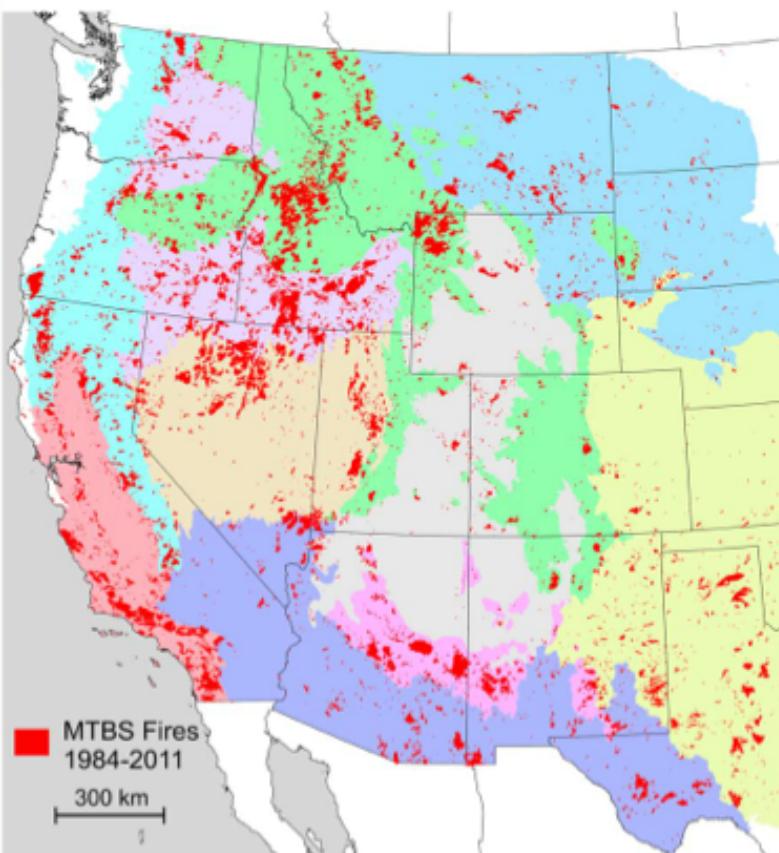
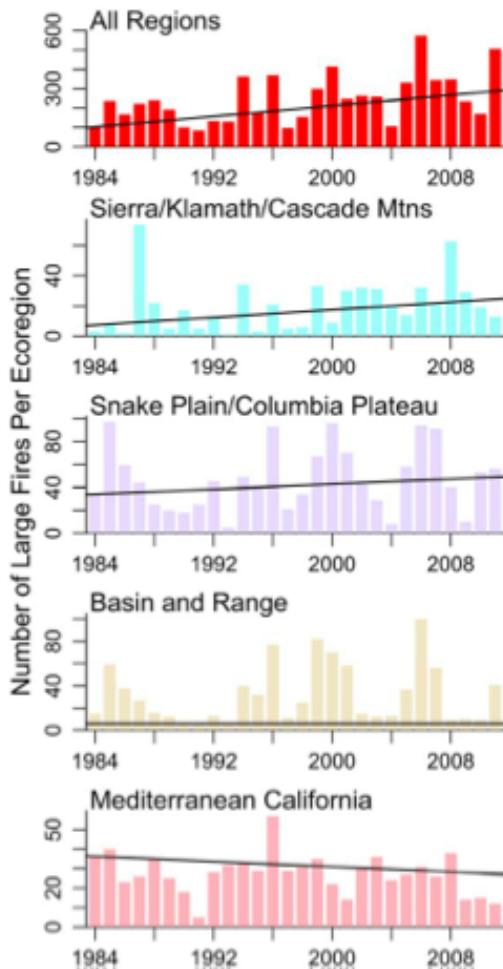
b) Human-caused fires

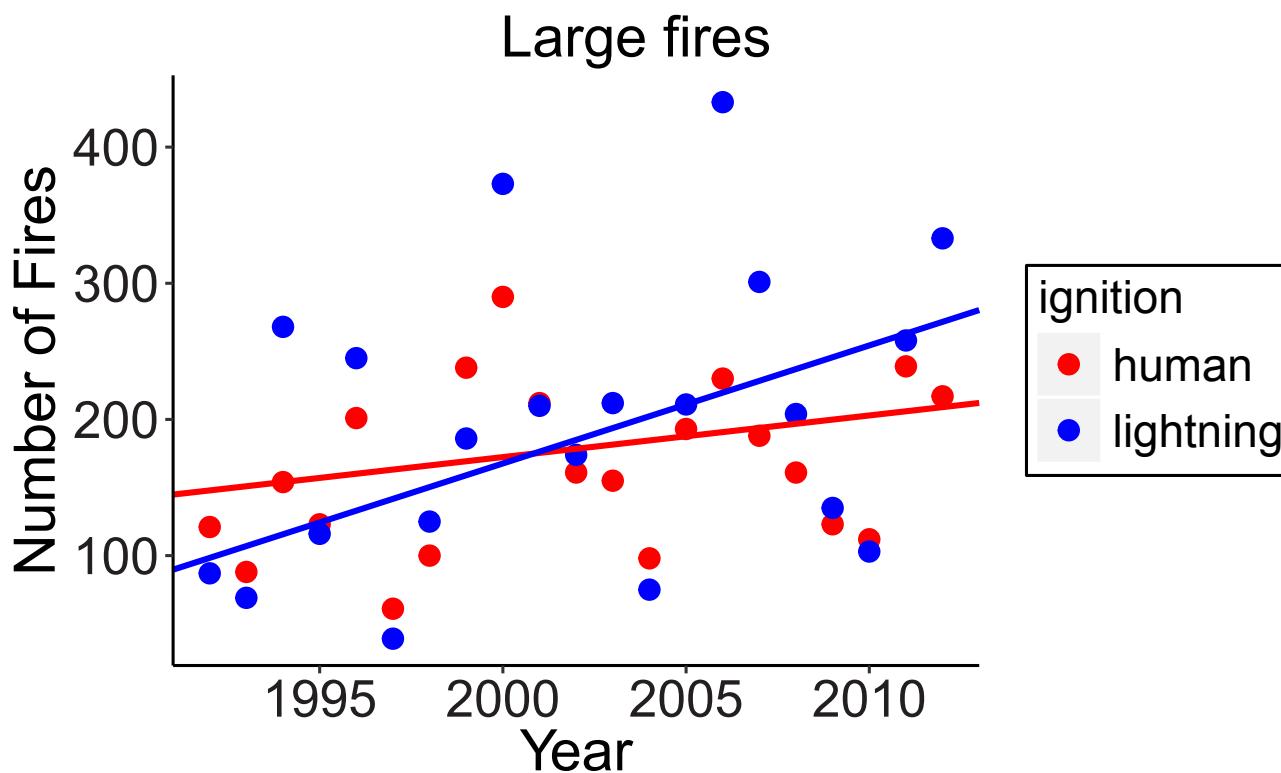


(a)

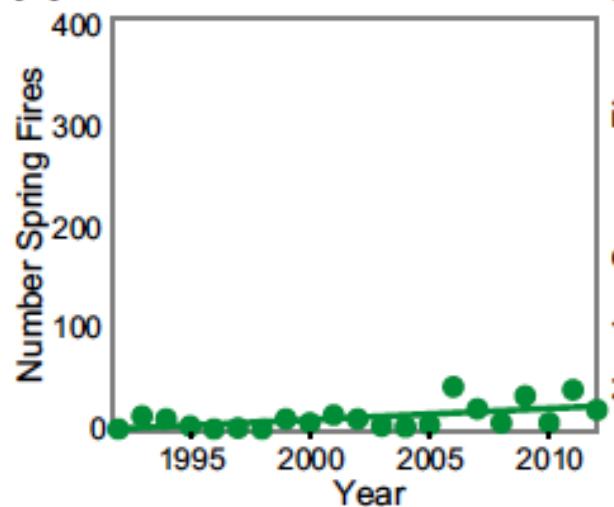
annual large (> 400 ha) forest fires



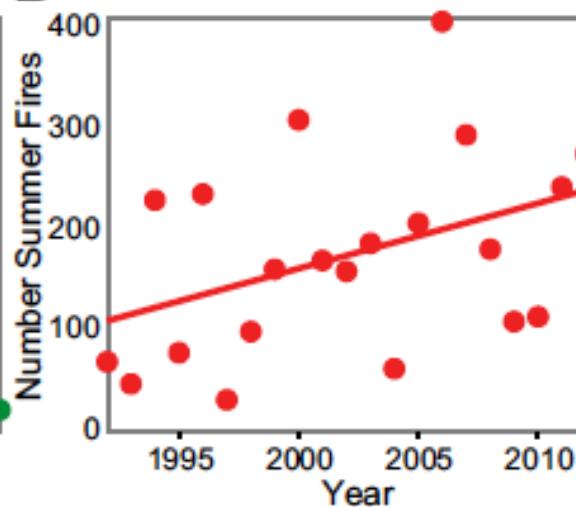




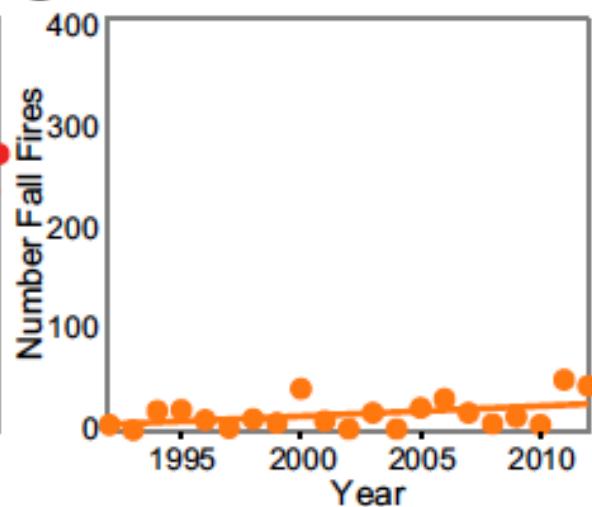
A Lightning-caused fires



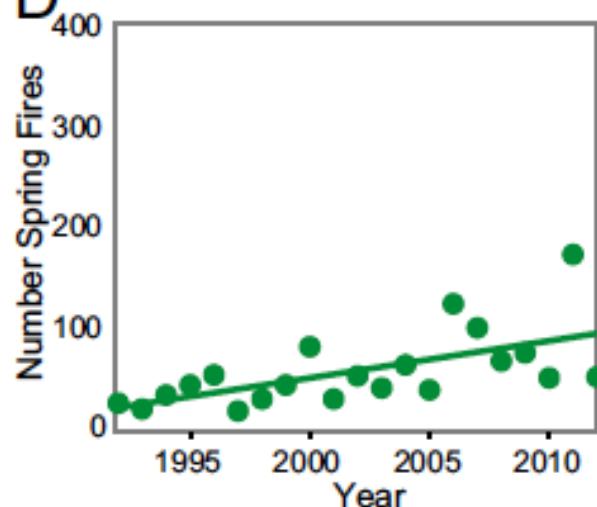
B



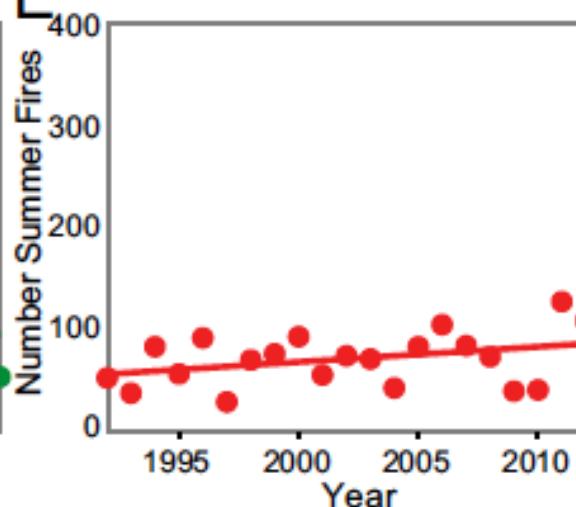
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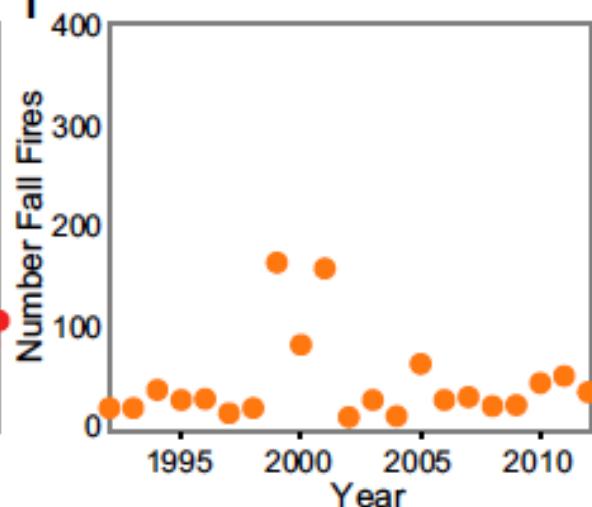
D Human-caused fires



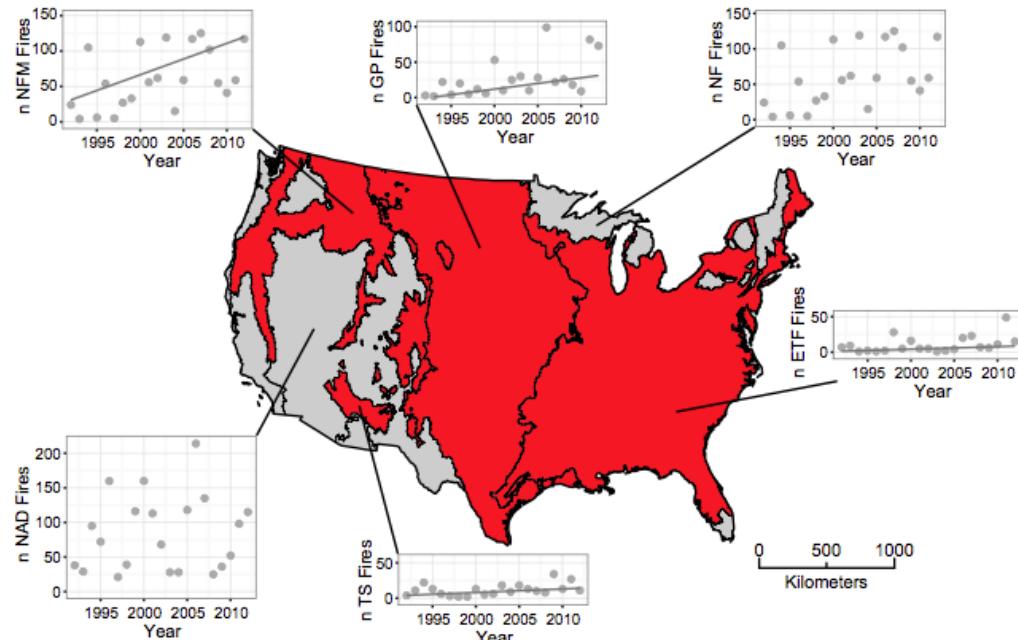
E



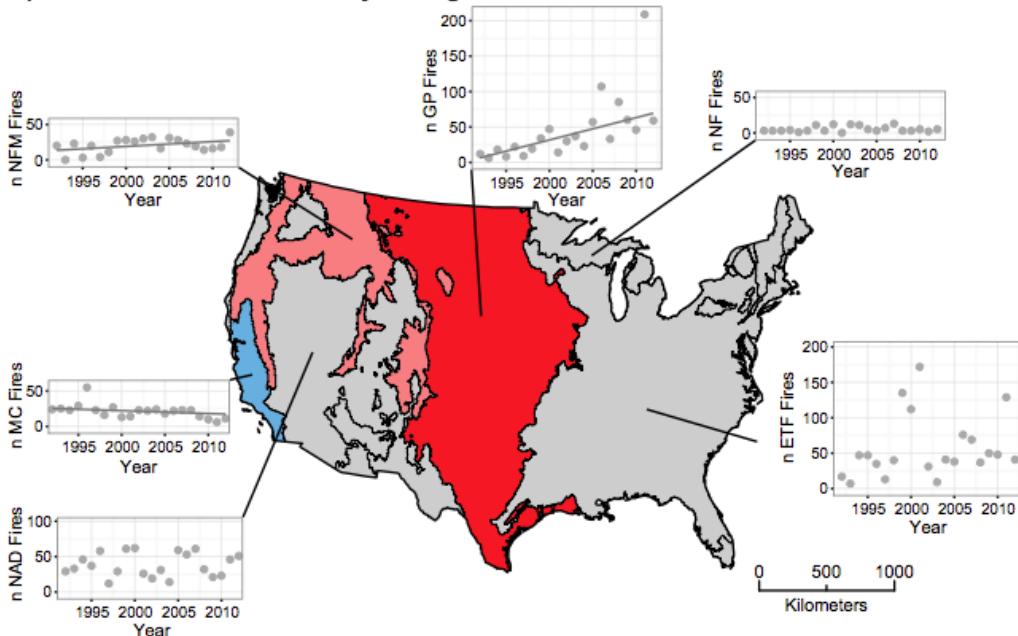
F



A) Lightning-caused fire trends by ecoregion

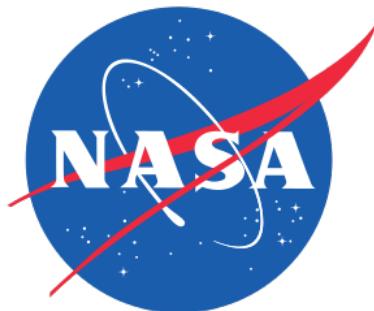


B) Human-caused fire trends by ecoregion



■ No significant trend ■ Decrease up to 100% ■ Increase up to 100% ■ Increase >100%

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2017 PNAS



Terrestrial Ecology Program



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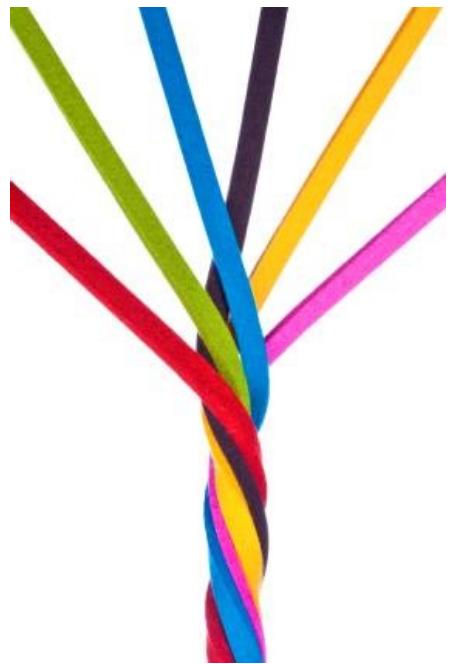
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Behavioral Science, National Snow and Ice Data Center,
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